

IWAMURA *et al.*, Serial No. 09/774,715
Amdt. dated 21 September 2004
Reply to OA mailed 21 May 2004

572.39563X00/P0360US
Page 2

IN THE CLAIMS:

1. (Currently Amended) An ATM communication apparatus ~~comprising~~
connected with a plurality of optical network units for issuing access permission to
permit transmission of ATM cells to said plurality of optical network units and for
receiving ATM cells comprises:

a traffic supervisory unit for supervising traffic situation of upstream ATM cells
~~sent~~ sending to said own ATM communication apparatus from a plurality of the
optical network units, the traffic supervisory unit having a supervisory unit of a
receiving bandwidth for detecting the receiving bandwidth ~~of~~ for receiving ATM cells
~~transmitted by~~ from each of said optical network units and a supervisory unit of cell
overflow situation for detecting cell overflow situation of a sending buffer of ATM
cells in each of said optical network units;

a bandwidth controller having a basic bandwidth assigner for assigning the
basic bandwidth for sending ATM cells to each of said optical network units, an
upper-limit bandwidth storage means for storing an upper-limit bandwidth set as an
upper limit of bandwidth for transmission of ATM cells of each of said optical network
units, a shared bandwidth assigner for assigning a shared bandwidth which is usable
with a basic bandwidth to each of said optical network units according to value of
said based on an upper-limit bandwidth and based on a receiving bandwidth and cell
overflow situation that ~~were~~ are supplied from said traffic supervisory unit, and the ~~a~~
shared bandwidth ~~memory storage means for maintaining storing the assigned~~

IWAMURA *et al.*, Serial No. 09/774,715
Amdt. dated 21 September 2004
Reply to OA mailed 21 May 2004

572.39563X00/P0360US
Page 3

shared bandwidth assigned to each of said optical network units by said shared bandwidth; and

a generator of access permission to transmit an upstream cell for generating access permission to transmit an upstream cell to the said assigned optical network units according to the shared bandwidth assigned by the said bandwidth controller.

2. (Currently Amended) The ATM communication apparatus according to claim 1, wherein said shared bandwidth assigner of said bandwidth controller comprises:

a bandwidth fair distributor for assigning the shared bandwidth based on the receiving bandwidth and the cell overflow situation ~~sent~~ supplied by said traffic supervisory unit; and

an upper-limit bandwidth limiter for limiting the upper-limit bandwidth based on the upper-limit bandwidth stored in the upper-limit bandwidth storage means.

3. (Currently Amended) The ATM communication apparatus according to claim 1, wherein said shared bandwidth ~~memory~~ storage means comprises a plurality of divided sub-shared bandwidth ~~memories~~ storage means and said shared bandwidth assigner further comprises a shared bandwidth selector for selecting any one out of a plurality of said sub-shared bandwidth ~~memories~~ storage means for each of ~~subscriber terminals respectively~~ said optical network units.

IWAMURA *et al.*, Serial No. 09/774,715
Amdt. dated 21 September 2004
Reply to OA mailed 21 May 2004

572.39563X00/P0360US
Page 4

4. (Current Amended) The ATM communication apparatus according to claim 1, comprising an access bandwidth storage means for storing an access bandwidth which is made by adding said basic bandwidth and said shared bandwidth for each of said optical network units.

wherein said supervisory unit of cell overflow situation comprises a bandwidth comparator that compares ~~the said~~ receiving bandwidth ~~of effective cells received from each of the optical network units and judges that the cell is in the overflow situation in the case where an~~ and said access bandwidth ~~judged by said bandwidth controller and a receiving cell bandwidth of~~ for each of the said optical network units ~~are the same or approximate~~ and judges said cell flow situation.

5. (Currently Amended) The ATM communication apparatus according to claim 1, wherein said supervisory unit of said cell overflow situation comprises an invalid cell detector that detects invalid cells received from each of ~~the said~~ optical network units and judges that the detected invalid cell is in the cell overflow situation in the a case where the invalid cell was not detected by the optical network units.

6. (Original) The bandwidth control apparatus according to claim 1, wherein said bandwidth controller assigns a plurality of the separate assignment bandwidths for one optical network unit to a plurality of the shared bandwidths respectively.

IWAMURA *et al.*, Serial No. 09/774,715
Amdt. dated 21 September 2004
Reply to OA mailed 21 May 2004

572.39563X00/P0360US
Page 5

7. (Original) The bandwidth control apparatus according to claim 1, wherein said bandwidth controller assigns the shared bandwidth based on a predetermined priority for each of the sub-shared bandwidths.

8. (Original) The bandwidth control apparatus according to claim 1, wherein said bandwidth controller provides a plurality of kinds of the basic bandwidths and assigns the shared bandwidth in proportion to each of the basic bandwidths.

9. (Original) The bandwidth control apparatus according to claim 1, wherein said bandwidth controller assigns one of the basic bandwidth and the shared bandwidth based on the contents of a plurality of subscriber contracts set for one optical network unit.

10. A bandwidth control method that issues permission to ~~transmit an upstream cell~~ permit transmission of ATM cells to a plurality of optical network units and controls a bandwidth of ATM cells received from each of said optical network units, comprising:

dividing a transmission bandwidth which said plurality of optical network units use for transmission of ATM cells to a basic bandwidth and a shared bandwidth;

dividing said basic bandwidth and assigning it to said optical network units;

setting an upper-limit bandwidth which represents an usable maximum bandwidth to each of said optical network units;

IWAMURA *et al.*, Serial No. 09/774,715
Amdt. dated 21 September 2004
Reply to OA mailed 21 May 2004

572.39563X00/P0360US
Page 6

supervising traffic situation of ~~an upstream~~ ATM cells sent from any one of a
plurality of the said optical network units; units and _____
_____ detecting receiving bandwidth status and overflow situation of the ATM cells,
which were ~~transmitted from a plurality of the~~ represents a bandwidth used by said
any one of said optical network units;

comparing a detected receiving bandwidth status and a bandwidth which is set
as an usable area to said any of said optical network units, and judging an access
whether a wider bandwidth of each of the than said bandwidth which is set to said
any one of said optical network units ~~according to the receiving bandwidth status and~~
~~the cell overflow situation, which were detected, and a basic bandwidth and an~~
upper limited bandwidth is needed or not;

~~guaranteeing the basic bandwidth determined for each of the optical network~~
~~units;~~

~~distributing the shared bandwidth in the range of the upper limit bandwidth~~
~~where bandwidth distribution is judged to be necessary for the optical network units~~
~~that are in the overflow situation or for the optical network units to which a shared~~
~~bandwidth is set beyond the basic bandwidth based on the detected receiving~~
~~bandwidth and the cell overflow situation~~

where it is judged that said wider bandwidth than said bandwidth which is set
to said any one of said optical network units is needed, assigning a shared
bandwidth with an amount according to said upper-limit bandwidth set to said any
one of said optical network units within said shared bandwidth, to said any one of
said optical network units;

IWAMURA *et al.*, Serial No. 09/774,715
Amdt. dated 21 September 2004
Reply to OA mailed 21 May 2004

572.39563X00/P0360US
Page 7

where a sum of said basic bandwidth of said any one of said optical network units and said assigned shared bandwidth does not exceed said upper-limit bandwidth, setting said sum as a bandwidth usable by said any of said optical network units, and where the sum exceeds said upper-limit bandwidth, setting said upper-limit bandwidth as a bandwidth usable by said any one of said optical network units; and

issuing access permission to said any one of said optical network units according to said bandwidth set to be usable by said any one of said optical network units.

11. (Original) The bandwidth control method according to claim 10, wherein the shared bandwidth to be distributed is further divided into sub-shared bandwidths in distributing said shared bandwidth such that selection is made as to from which sub-shared bandwidth the distribution is performed on every optical network unit out of a plurality of the divided sub-shared bandwidths.

12. (Currently Amended) The bandwidth control method according to claim 10, wherein for assigning the shared bandwidth to said any one of said optical network units, the shared bandwidth is assigned based on the receiving bandwidth and the cell overflow situation, which were supervised, to limit to said any one of said optical network units with the rate of the upper-limit bandwidth based of said any one of said optical network units to sum of the upper-limit bandwidth of said plurality of said optical units.

Best Available Copy

IWAMURA *et al.*, Serial No. 09/774,715
Amdt. dated 21 September 2004
Reply to OA mailed 21 May 2004

572.39563X00/P0360US
Page 8

13. (Currently Amended) The bandwidth control method according to claim 10, wherein ~~the~~ said receiving bandwidths of ~~the~~ said effective cells, which were received from each of ~~the~~ said optical network units, are compared to judge that the cell is in the overflow situation in the case where the judged access bandwidth and ~~the~~ said receiving cell bandwidth of each of ~~the~~ said optical network units are substantially the same or approximate.

14. (Currently Amended) The bandwidth control method according to claim 10, wherein ~~the~~ an invalid ~~cells, which were~~ cell received from each ~~any~~ of the optical network units, ~~are~~ units is detected to judge that the detected invalid cell is in the overflow situation in the case where the invalid cell was not detected by the optical network unit.

15. (Original) The bandwidth control method according to claim 10, wherein a plurality of the separate assignment bandwidths for one optical network unit are assigned to a plurality of the shared bandwidths respectively.

16. (Original) The bandwidth control method according to claim 10, wherein the shared bandwidth is assigned based on a predetermined priority for each of the sub-shared bandwidths respectively.

Best Available Copy

IWAMURA *et al.*, Serial No. 09/774,715
Amdt. dated 21 September 2004
Reply to OA mailed 21 May 2004

572.39563X00/P0360US
Page 9

17. (Original) The bandwidth control method according to claim 10, wherein a plurality of kinds of the basic bandwidths are provided to assign the shared bandwidth in proportion to each of the basic bandwidths respectively.

18. (Original) The bandwidth control method according to claim 10, wherein one of the basic bandwidth and the shared bandwidth is assigned based on the contents of a plurality of subscriber contracts set for one optical network unit.

Best Available Copy